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EXAMINER	
HU, SHOUXIANG	
ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 01/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/944,186	YAMAGUCHI ET AL.	
	Examiner	Art Unit	
	Shouxiang Hu	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 October 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *71,75-80,121-125 and 129-131* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *71,75-80,121-125 and 129-131* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *20040924*.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. *20041222*.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 71, 75-80, 121-125, and 129-131 are objected to because of the following informalities and/or defects:

Claim 71 recites the terms of "threshold mode gain", "internal loss", "slope efficiency" and "differential gain", however, it fails to clarify under what conditions these parameters are defined, since they each are determined by various factors. For example, the values may each substantially differ if they are measured under different temperatures.

Claim 129 recites the subject matter that the microscopic fluctuations are not less than 20 meV, but the disclosure lacks an adequate description regarding how such subject matter could be correlated with the other conditions as defined and required in claim 71.

Appropriate correction is required.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double

patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claims 71, 75-80, 121-125, and 129-131 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-64 of US Patent 6,642,546. Although the conflicting claims are not identical, they are not patentably distinct from each other because they are both directed to a basically same invention about a semiconductor laser device having an InAlGaN light emitting layer with a microscopic fluctuation in its band gap energy of no more than 40 meV, because such a microscopic fluctuation in the band gap energy is inherently equivalent to a microscopic fluctuation in its indium composition of no more than 0.0067 (see col. 18, lines 39-43 in US Patent 6,642,546); and, because the first through third conditions recited in claim 71 of the instant invention are inherently mutually correlated, and they are all well-recognized parameters of importance subject to routine experimentation and optimization.

Claim Rejections - 35 USC § 102 or § 103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States

only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 71, 76, 77, 79, 121, 124, 125, 130 and 131, as being best understood in view of the claim objections above, are rejected under 35 U.S.C. 102(e) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Domen et al. ("Domen"; US 6,555,403).

Domen discloses a semiconductor device having a semiconductor multi-layer structure (particularly see Figs. 5 and 19-20, and col. 24, lines 34-40, col. 25, lines 45-55, col. 26, line 2, through col. 27, line 64, and col. 63, lines 23-24), comprising an active layer (16) having a quantum well ($In_{0.5}Ga_{0.85}N$) as part of a luminescent layer (an $In_xAl_yGa_{1-x-y}N$ layer, with y=0, which naturally functions as a quantum well), wherein a threshold mode gain of the single quantum well can be more than 12 cm^{-1} (see G_{th} in Fig. 19; also see "MODEAL GAIN" in Fig. 5). And, Domen further discloses that the band gap fluctuation (through photo-luminescence peak wavelength distribution) for the active layer is less than 20 meV (col. 25, lines 53-55), or even as low as 5 meV (col. 24, lines 34-40). Accordingly, the photo-luminescence peak wavelength distribution for the active layer in Domen can be far less than the 40 meV as recited in the instant invention, and even much lower than the 17 meV provided in the best mode of the

instant invention (see page 82, lines 22 and 23). Furthermore, Domen teaches the importance of reducing the indium composition fluctuation in the optical active layer (see col. 24, line 17, through col. 25, line 55). And, the PL peak wavelength distribution in Domen is directly correlated with the indium composition fluctuation and is required to be less than 20 meV, which naturally covers a PL peak wavelength distribution of substantially close to zero meV. It would then naturally corresponds to a virtually zero indium composition fluctuation in the optical luminescent layer. In addition, the optical luminescent layer in Domen further undergoes an equivalent high temperature treatment during the formation of the subsequent layers (e.g., layers 17-19; see col. 27, lines 7-31) of up to 4.3 microns in thickness at a substantially elevated temperature of up to 1200 ^{0}C, which should naturally lead to a process condition substantially equivalent and/or similar to the one used in the instant invention for forming the recited optical luminescent layer. Therefore, the degree of indium composition fluctuation in the optical luminescent layer of Domen should naturally be substantially equivalent to that in the instant invention, regardless whether a same method is used to measure it. And, regardless what measurement method is recited, a specific method for measuring the indium composition fluctuation may only constitutes a process limitation, which may not necessarily result in actual difference in the indium composition fluctuation. And, it has been held that the process limitations would not carry patentable weight in the claim drawing to a structure, because distinct structure is not necessarily produced. In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985).

Therefore, both the microscopic and macroscopic fluctuations in the luminescent layer in Domen should be no more than 40 meV. In addition, the differential gain (dg/dn) in Domen can be naturally no less than 10^{-20} (m^2), according to the inherent relationship between the differential gain and the microscopic fluctuation shown in Fig. 10 of the instant invention.

Or, in the alternative, as Domen teaches the importance of reducing the indium composition fluctuation in the optical active layer, one of ordinary skill in the art would be motivated to reduce or even eliminate any indium composition fluctuation therein in order to improve and optimize the performance of the laser device. And, which would naturally result in a degree of indium composition fluctuation that would naturally correspond to the recited fluctuation in the band gap energy.

Regarding claims 79 and 127, Domen further discloses that the substrate can be sapphire (col. 63, lines 23-24).

Regarding claim 121, the microscopic indium composition fluctuation in Domen is naturally no more than 0.067, according to the inherent relationship between it and the microscopic band-gap energy fluctuation (as shown in page 50, line 11, of the instant invention), when the microscopic bad-gap energy fluctuation is no more than 40 meV.

Regarding claim 124, the recited relationship between the internal loss and the mirror loss can be naturally met in Domen, provided that the threshold mode gain (which by definition equals to the sum of the internal loss and the mirror loss) of the single quantum well is more than 12 cm^{-1}.

Regarding claims 130 and 131, it is noted that the limitations recited in these claims regarding how the microscopic fluctuation is measured are process limitations; and these would not carry patentable weight in this claim drawing to a structure, because distinct structure is not necessarily produced. In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claim 129, as being best understood in view of the claim objections above, is rejected under 35 U.S.C. 103(a) as being unpatentable over Domen et al. ("Domen"; US 6,555,403).

The disclosure of Domen is discussed as applied to claims 71, 76, 77, 79, 121, 124, 125, 130 and 131 above.

Although Domen does not expressly disclose that the microscopic fluctuations are not less than 20 meV, Domen does teaches that the indium composition fluctuation is a result-oriented parameter of importance, which is subject to routine experimentation and optimization.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to the semiconductor laser device of Domen with the

indium composition fluctuation being adjusted and optimized for obtaining optimized performance of the semiconductor laser device. And, such optimized range of indium composition fluctuations would naturally and equivalently cover the recited the microscopic fluctuations in the band gap energy, since the two are naturally correlated.

5. Claims 75, 78, 80, 122 and 123 are rejected under 35 U.S.C. 103(a) as being unpatentable over Domen et al. ("Domen"; US 6,555,403) in view of Razeghi (US 6,459,096) and/or applicant's admitted prior art ("AAPA").

The disclosure of Domen is discussed as applied to claims 71, 76, 77, 79, 121, 124, 125 and 129-131 above.

Domen does not expressly disclose that the semiconductor laser device can have a cavity length "L" of not less than 1000 micrometers, that the reflectance of the first facet is not more than 20%, and the reflectance of the second facet is not less than 80% and less than 100%; and that the substrate can also be GaN. However, one of ordinary skill in the art would readily recognize that longer cavity length can desirably reduce the threshold current density and increase the output, as evidenced in Razeghi (see Fig. 6, in which the cavity length can be larger than 1 mm); that one of the facets can be desirably coated to have a high reflectance in order to reduce the threshold current density in the laser and increase the optical output from the uncoated output facet, as evidenced AAPA (see page 6, line 21, through page 7, line 1; in which the coated facet has a reflectance of 95%. And, it is noted that the uncoated facet would inherently have a reflectance of less than 20% (see page 70, lines 8-14, in the instant

specification)); and that the GaN–based multiple layers can be directed formed on a GaN substrate for better lattice match therebetween, as also evidenced in AAPA (see the GaN substrate 121 in Fig. 2).

Therefore, it would have been obvious to one of ordinary skill in the art t the time the invention was made to incorporate the above-1-mm cavity length of Razeghi and the single-facet coated mirror and the GaN substrate of AAPA into the semiconductor laser device of Domen, so that a laser device with reduced threshold current density, improved optical output and reduced defects in the active layer would be obtained.

Regarding claims 75, 122 and 123, the recited limitations for the slope efficiency would be naturally met in the above collectively taught laser device, since the reflectances of the paired facets and the cavity length (they together also determines the mirror loss) in the above collectively taught laser device would be substantially the same as that in the instant invention.

Regarding claim 80, it is noted that it is art-recognized that low surface dislocation density in the substrate is very critical for the epitaxial growth of high quality multiple GaN-based layers; and that a surface dislocation density of lower than $10^8/cm^2$ can be readily achieved for a GaN substrate, since even in a derived GaN substrate the surface dislocation density can be already as low as about $10^6/cm^2$ or lower (as evidenced in the prior art such as Tsuda et al., US 6,294,440; see col. 2, lines 25-29).

Response to Arguments

Applicant's arguments filed on 12-08-03 have been fully considered but they are not persuasive. Responses to these arguments have been fully incorporated into the claim rejections and objections set forth above in this Office action.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH
December 22, 2004

SHOUXIANG HU
PRIMARY EXAMINER